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(19)(CA) **APPLICATION FOR CANADIAN PATENT** (12)

(54) Sampler and Desorber Unit for Detection of Drug and Explosives Particulates

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(57) 2 Claims

ABSTRACT

In a device for collecting vapours from particulates of target substances for analysis, in an environment which contains considerable extraneous particulates of greater or less volatility than the particulates of the target substances, the improvement comprising a first metal screen surface for collecting the particulates of the target substances in the environment containing the extraneous particulates; heater means connected to the first metal screen surface for maintaining the first metal screen surface at a sufficiently high temperature to volatilize the particulates of the target substances, but not the less volatile extraneous particulates, thereby creating volatized vapours from the target particulates; and a second metal screen surface for collecting the volatilized vapours from the target particulates for further analysis.

SAMPLER/DESORBER UNIT FOR DETECTION OF DRUG AND EXPLOSIVE PARTICULATES

Field of the Invention

This invention relates in general to illicit drug and explosive detection equipment, and more particularly to a sampler/desorber unit for collecting vapours of particulates of certain drugs and explosives and transferring the collected particulates in vapour form to a remote location for subsequent analysis.

Background of the Invention

In the practice of law enforcement against the transport of illicit drugs by traffickers, and of explosive charges by terrorists, a number of devices have been employed for the detection of these undesirable substances. Among the most specific and sensitive of these devices have been analytical instruments, based on gas chromatography, ion-mobility spectroscopy and mass spectrometry.

Ultimately, all these devices operate on a vapour phase detection for indication of the presence of specific substances. Some of these substances have a sufficiently high intrinsic vapour pressure (e.g. EGDN (in dynamite), NG and TNT) to provide detectable vapours in their vicinity. Others, including cocaine, heroin, and the "plastic" explosives (RDX and PETN) have little or no vapour pressure at room temperature and, therefore, cannot be detected through the analysis of ambient air.

These low vapour pressure substances, however, commonly occur in fine particulate form, either as loose powder (cocaine or heroin) or with a plasticized binder ("plastic" explosives). Fine particulates of these substances are prone to adhere to objects with which they have come in touch, either hands, clothing, suitcases, etc. It has been well demonstrated that such particulates may be effectively collected, variously by vacuuming, or swabbing, etc., and then vaporized by heating so that the resultant

vapour may be passed into a suitable analytical device, for detection.

Unfortunately, the process of collection of these particulates, in most environments, results in the collection of a sample containing much extraneous material, both organic and inorganic, which is far greater in mass than the targeted substances. The presence of this extraneous material is detrimental to the proper functioning of the detection system. For one thing, if the entire sample were vaporized, the resultant vapours would overload the sensitive detector. In addition, the solid residue left after heating of the sample would impede the collection of the next sample.

Summary of the Invention

It is an object of an aspect of this invention to provide a sampler/desorber unit, for the collection of particulates of certain drugs and explosives, in dirty environments, and for the transfer of any such particulates, in vapour form, to another point where the target substances will be deposited, relatively free of extraneous matter. The resultant sample is then more suitable for subsequent analysis in an appropriate analyzer.

According to the present invention, an apparatus is provided for collecting for analysis, particulates of target substances in an environment which contains considerable extraneous particulates. The apparatus includes a first metal screen surface for collecting a sample including all particulates, a heater for maintaining the first screen surface at a temperature high enough to volatilize the target particulates, but not the less volatile particulates, and a second metal screen surface for collecting the volatilized vapours from the particulates.

Brief Description of the Drawings

A detailed description of the invention is provided herein below with reference to the following drawings, in which:

Figure 1 is an elevation view of a sampler/desorber unit according to the preferred embodiment;

Figure 2 shows various details of the collector/desorber areas according to the preferred embodiment; and

Figure 3 is an elevation view of the sampler/desorber unit, disassembled, in its major components.

Detailed Description of the Preferred Embodiment

Turning to Figure 1, the sampler/desorber unit of the preferred embodiment is shown comprising a fan 1 which is driven by a fan motor 14A (Figure 3) for drawing air through the unit, creating suction at the nozzle 2. Particulates of all descriptions are drawn into the collector/desorber area 3 and come to rest on a first metal mesh tray card 4. This tray card is in direct contact with a heater wire and screen assembly, which maintains it at a temperature high enough to vaporize (desorb) the target particulates.

Vapours from the desorption then pass through a second metal mesh sample card 5, which is in a much cooler environment than the tray card 4, so that some of the vapours are caused to condense on the sample card. The temperature of tray card 4 for causing desorption and the temperature of the sample card 5 for causing condensation, are each controlled so as to ensure as complete a transfer of the target vapours as possible, while allowing the more volatile material to pass through the system and be vented at 6, and the less volatile material to remain unvolatilized on the tray card.

The following table summarizes a list of optimum

temperature of the sample card and tray card, to achieve the above-mentioned objectives:

TABLE

Substance	Sample Card Temperature	Tray Card Holder
Cocaine	90 - 100 deg. C	190 - 220 deg. C
Heroin	89 - 110 deg. C	200 - 235 deg. C
THC	88 - 104 deg. C	190 - 200 deg. C
C4 (RDX)	90 - 110 deg. C	204 - 220 deg. C
PETN	80 - 100 deg. C	150 - 200 deg. C

The indicated temperature ranges are for optimum transfer of substance of interest, with minimum amounts of decomposition.

Adherence of these substances to silica, dust, etc. requires relatively higher desorption temperatures for releasing these materials in the gas phase. In such instances, the heater temperature is selected to lie in the range of 235 - 260 deg. C. The compromise is lower PTN transfer to the sample card, because PETN undergoes decomposition at temperatures in the range of 150 - 200 deg. C. Under these higher desorption temperatures, only a fraction of the PETN will be transferred to the sample card.

The sample card 5 is then withdrawn from the desorber area 3, and transferred to a suitable detector (not shown) for a second desorption and analysis. One example of a suitable detector is the Scintrex Model TND-100 Trace Narcotics Detector. It is based on the principle of gas chromatography and a nitrogen-phosphorous detector. Other suitable detectors are the Ionscan unit of Barringer Technologies (IMS technology) and the Sentor and EGIS detectors of Thermedics, Inc., etc. The sample thus provided to the detector is relatively clean.

The tray card 4 may be withdrawn for cleaning, and the collector/desorber chamber 3 is constructed so that it may be readily opened and cleaned of the residues of the sample, as and when required.

*Figure 2 shows some details of the collector/desorber area 3, including the heater wire assembly 8, which is heated by passing current through electrical contacts 9. The tray card 4 contains a stainless steel mesh section 10 on which the original sample is collected and vaporized.

Figure 3 shows the preferred embodiment of Figure 1, broken down into its mahor components, e.g. for replacement of battery 7, and for cleaning of the collector-desorber area 3.

The disassembly of the latter for cleaning is readily accomplished by means of a thumb nut 11 which, when activated, allows the quick removal of the nozzle and front section housing of the collector-desorber chamber.

The sampler/desorber unit of the present invention may be battery powered via a battery 7 for hand-held use, or by mains power for other applications.

The unit of the present invention is suitable, for example, to remote controlled entry into large shipping containers and for hand-held checking of individuals, clothing and luggage, etc.

Modifications and alternative embodiments of the invention are possible within the sphere and scope of the claims appended hereto.

WE CLAIM:

1. In a device for collecting vapours from particulates of target substances for analysis, in an environment which contains considerable extraneous particulates of greater or less volatility than said particulates of said target substances, the improvement comprising:

   i) a first metal screen surface for collecting said particulates of said target substances in said environment containing said extraneous particulates;

   ii) heater means connected to said first metal screen surface for maintaining said first metal screen surface at a sufficiently high temperature to volatilize said particulates of said target substances, but not said less volatile extraneous particulates, thereby creating volatized vapours from said target particulates; and

   iii) a second metal screen surface for collecting said volatilized vapours from said target particulates for further analysis.

2. The improvement of claim 1, wherein said second metal screen surface is maintained at a temperature which is sufficiently low to condense said vapours of said target substances and sufficiently high that vapours having greater volatility than said vapours of said target substances will not be collected thereon.

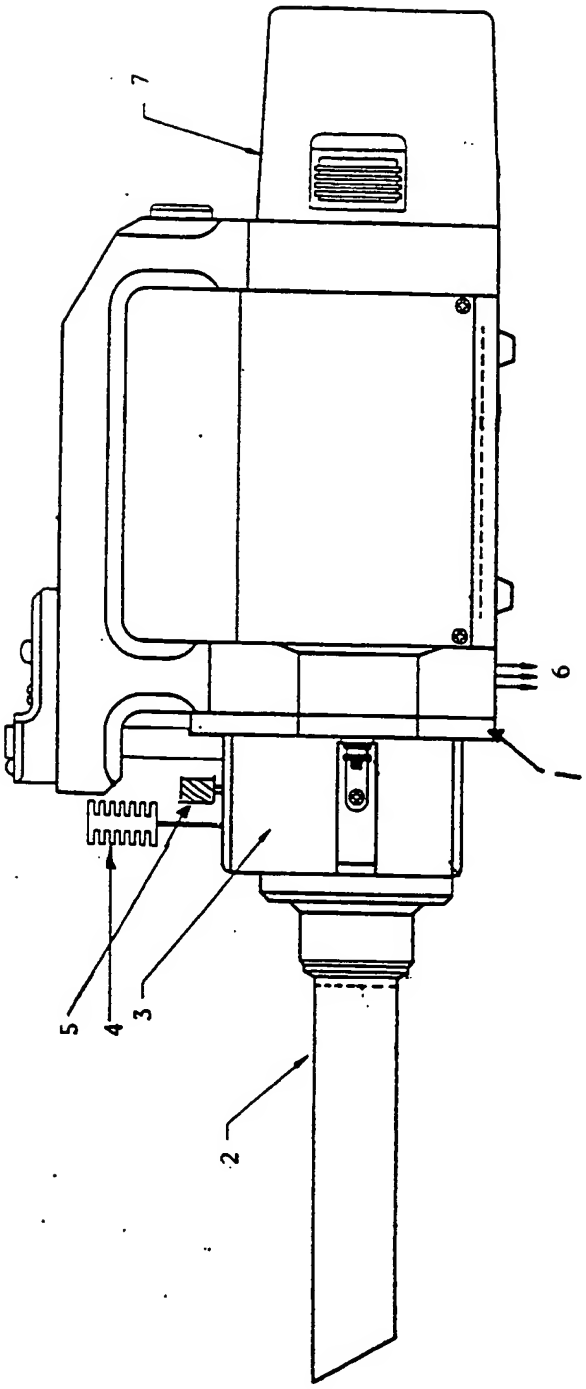

FIGURE 1

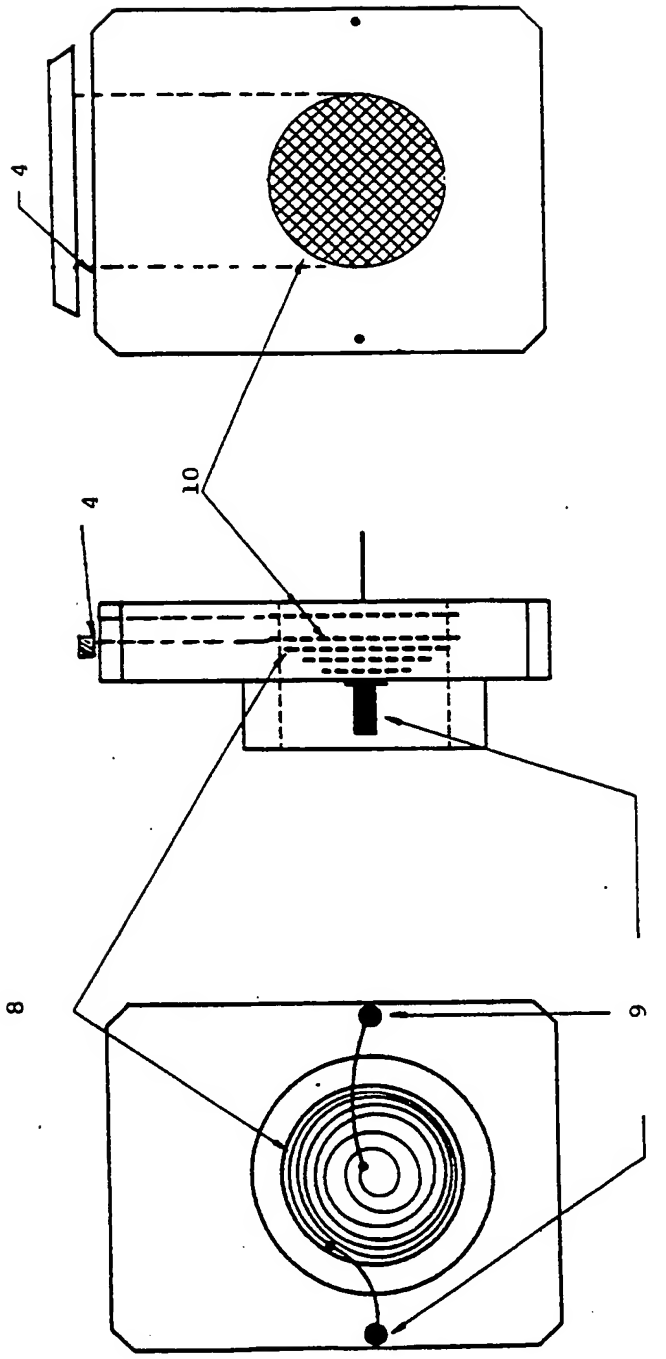

FIGURE 2

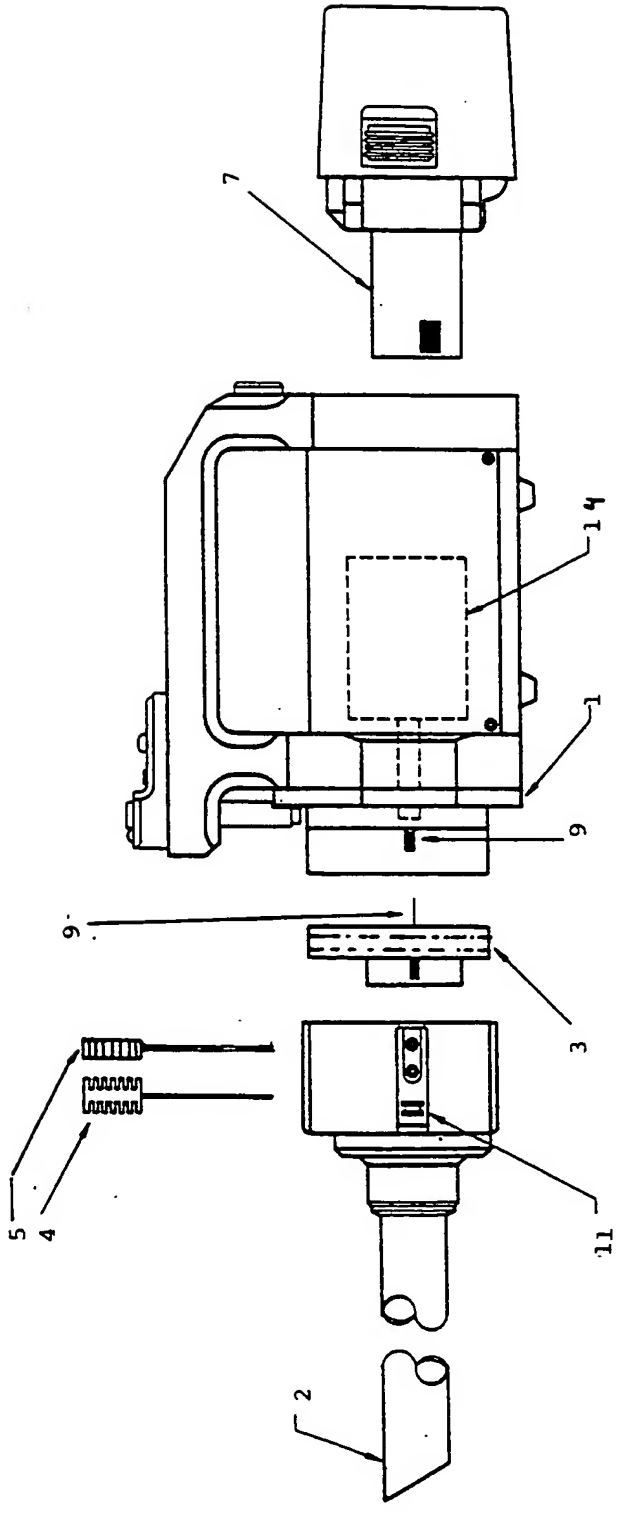

FIGURE 3